

WHAT IS CLAIMED IS:

1 1. A highly efficient method for transducing stem cells with a vector
2 particle containing a gene of interest, which method comprises contacting target stem cells
3 with vector particles pseudotyped with feline endogenous virus RD114 envelope protein and
4 containing a gene of interest, wherein the vector particles are substantially free of factors that
5 induce stem cell differentiation.

1 2. The method of claim 1, wherein the vector particle is a retroviral vector
2 particle comprising a modified retroviral genome containing the gene of interest.

1 3. The method of claim 2, wherein the retroviral vector particles are freed
2 of factors that induce stem cell differentiation by being substantially free of producer cells and
3 producer cell supernatant.

1 4. The method of claim 3, wherein the retroviral particles are pre-adsorbed
2 onto a surface that promotes adherence of the retroviral particles.

1 5. The method of claim 4, wherein the surface is coated with an adherence
2 promoting agent.

1 6. The method of claim 5, wherein the adherence promoting agent is
2 retronectin.

1 7. The method of claim 2, wherein the retroviral particles are freed of
2 producer cells and producer cell supernatant by ultracentrifugation.

1 8. The method of claim 2 wherein the retroviral particle is an oncoviral
2 particle.

1 9. The method of claim 2 wherein the retroviral particle is a lentiviral
2 particle.

1 10. The method of claim 1 wherein the target stem cells are pre-stimulated.

1 11. The method of claim 10, wherein the target stem cells are prestimulated
2 by treatment with signaling molecules selected from the group consisting of cytokines, growth
3 factors and phytohemagglutinin.

1 12. The method of claim 1 wherein the target stem cells are hematopoietic
2 stem cells.

1 13. The method of claim 12 wherein the target hematopoietic stem cells are
2 selected from the group consisting of cord blood cells, mobilized peripheral blood cells, bone
3 marrow cells, and liver.

1 14. The method of claim 13, wherein the target hematopoietic stem cells
2 are selected from the group consisting of CD34⁺ cells and CD34⁺ CD38⁻ cells.

1 15. The method according to claim 2, wherein upon engraftment of the
2 transduced stem cells contacted one time with the retroviral particles into a host, greater than
3 10% of the transduced cells express the gene of interest.

1 16. The method according to claim 15, wherein greater than about 40%
2 of the transduced cells express the gene of interest.

1 17. A population of stem cells transduced with vector particles
2 pseudotyped with feline endogenous virus RD114 envelope protein and containing a gene of
3 interest, wherein the population of stem cells are substantially undifferentiated.

18. The population of stem cells of claim 17, wherein the vector particle
is a retroviral particle comprising a modified retroviral genome containing the gene of interest.

1 19. The population of stem cells of claim 18, wherein upon engraftment
2 of the stem cells into a host, the number of stem cells in the host that express the gene of
3 interest is greater than 10% times a number of exposures of the stem cells to the retroviral
4 vector particles.

1 20. The population of stem cells of claim 18, wherein the stem cells
2 were transduced by a single exposure to the retroviral vector particles and upon engraftment
3 of the stem cells into a host, greater than about 40% of the stem cells express the gene of
4 interest.

1 21. A method for introducing a gene of interest into a host, which
2 method comprises introducing the transduced stem cells of claim 17 into a host.

1 22. The method according to claim 21, wherein the host is a human and
2 the stem cells are human stem cells.

1 23. The method according to claim 21, wherein the host is an
2 immunodeficient animal and the stem cells are human stem cells.

1 24. The method according to claim 21, wherein upon engraftment of the
2 transduced stem cells contacted one time with the retroviral particles into a host, greater than
3 10% of the transduced cells express the gene of interest.

1 25. The method according to claim 24, wherein greater than about
2 40% of the transduced stem cells express the gene of interest.

1 26. A method of treating a disease or disorder, which method
2 comprises administering to a patient a therapeutically effective dose of the transduced stem
3 cells of claim 17, wherein the gene of interest is a therapeutic gene.

1 27. The method of claim 26, wherein the disease or disorder is
2 selected from the group consisting of hematopoietic disease, neural disease, joint-related
3 disease, muscular disease, and liver disease.

1 28. A non-human animal engrafted with the stem cells of claim 17.

1 29. The non-human animal of claim 28, which is an immunodeficient
2 mouse.

1 30. The non-human animal of claim 28, which is a monkey.

1 31. A kit comprising retroviral vector particles pseudotyped with feline
2 endogenous virus RD114 envelope protein and containing a gene of interest their genome pre-
3 adsorbed onto a surface that promotes adherence of the retroviral particles, wherein the
4 retroviral vector particles are substantially free of producer cells and producer cell
5 supernatant.

1 32. The kit of claim 31, wherein the surface is coated with an adherence
2 promoting agent.

1 33. The kit of claim 32, wherein the adherence promoting agent is
2 retronectin.

1 34. A method for preparing a kit comprising retroviral vector particles
2 pseudotyped with feline endogenous virus RD114 envelope protein and containing a gene of
3 interest their genome pre-adsorbed onto a surface that promotes adherence of the retroviral
4 particles, wherein the retroviral vector particles are substantially free of producer cells and
5 producer cell supernatant, which method comprises contacting the surface with the retroviral
6 vector particles for a sufficient period of time to permit adherence of the retroviral particles to
7 the surface, and removing supernatant in which the retroviral particles were suspended from
8 the surface.

1 35. The method of claim 34, wherein the surface is coated with an
2 adherence promoting agent.

1 36. The method of claim 35, wherein the adherence promoting agent is
2 retronectin.

1 37. The method of claim 34, further comprising storing the retroviral
2 particles adsorbed onto the surface at -70°C .